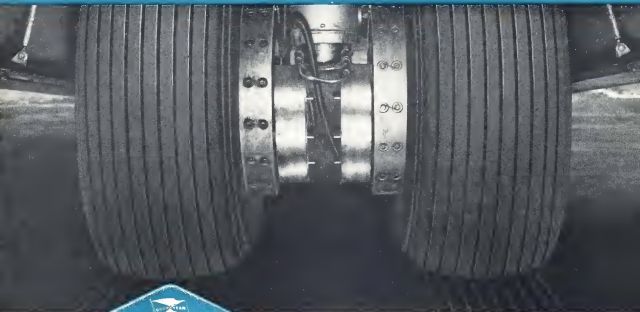


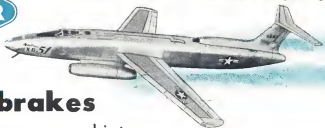
# AVIATION WEEK

MAR. 6, 1950

A MCGRAW-HILL PUBLICATION



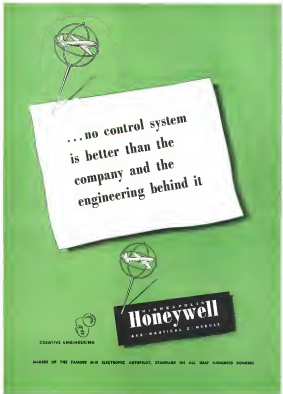
Close-up of rear main gear shows location of two Goodyear Single Disc Brakes



## Super-safe brakes for a super-powered jet

To solve the braking problem on the new super-fast, three-jet XB-51, Goodyear designed and built Single Disc Brakes to fit its unique tandem-type landing gear. For years of experience prove these extra-dependable, super-safe Goodyear brakes are

unequalled for maximum energy absorption within a minimum space. That's why *more aircraft are equipped with Goodyear brakes than any other kind.* For details, write: Aviation Products Division, Goodyear, Akron 16, Ohio or Los Ang



...no control system  
is better than the  
company and the  
engineering behind it

MINNEAPOLIS  
**Honeywell**  
AERONAUTICAL DIVISION

CREATIVE ENGINEERING

MAKERS OF THE FAMOUS H-E ELECTRONIC AUTOPLOT, STANDARD ON ALL USAF AIRCRAFT BOMBERS



## For Better End Results

Whether in a delicate, precision instrument, a simple machine part, or a large complicated mechanism, ball bearings are used to achieve a certain preconceived standard of performance or end result.

Products of long experience, finer materials and the most advanced methods available today, New Departure ball bearings assure greater accuracy, smoother operation, longer life . . . in short, better end results, whatever the requirements may be.

*Nothing Rolls Like a Ball*

## NEW DEPARTURE BALL BEARINGS

NEW DEPARTURE • Division of GENERAL MOTORS CORPORATION • BRISTOL, CONNECTICUT • BRANCHES IN ALL PRINCIPAL CITIES



# ZERO reader

the pilot's instrument .....

➤ Sperry's background and experience in developing precision flight instruments to make flying easier for the pilot under all conditions is reflected in the new zero reader\*... truly, the pilot's instrument.

➤ For the Sperry ZERO READER combines the type of information usually supplied by two essential instruments — relieves the pilot of complex mental calculations — gives him more time to concentrate on other factors vital to the success of his flight plan.

➤ The ZERO READER — developed by Sperry with the encouragement and cooperation of Air-Weather Flying Devices, USAF and the Air Transport Association — makes military and commercial aviation increasingly independent of weather — helps pilots to make cross-country flights, approaches and landings with greater ease and safety regardless of visibility.

➤ The ZERO READER takes its place in a long chain of Sperry "firsts" including the Gyro-Horizon, Directional Gyro, Gyrocompass and Gyroplot. Like them, it was evolved from Sperry research, engineering, precision manufacture and flight testing.

PRECISION  
AND PROOF



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DIVISION OF THE SPERRY CORPORATION  
GREAT NECK, NEW YORK  
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## NEWS SIDELIGHTS

### Piasecki Advertises

A magazine ad has been placed in an aviation computer magazine to advertise the 'punch' was a HRP-2000 ad placed by Piasecki Helicopter Corp. in the *Aviation* (CASA) Post, from the paper of *Aviation* magazine.

Placed: Piasecki Wins Again? The ad called for experienced engineers and designers to help design and build the HRP-2000 for the Air Force, and can be called 'Advance With the Winner'.

At Piasecki of Meriden Pa., has been since the late 1950s experienced helicopter engineers. After leaving Sikorsky in two separate competitions, the Navy shopped helicopter competitors and the main account USAF some helicopter competitors—the offer will be an additional hole blow at the Budget first.

But the ad did raise a new question for the newsmen in the helicopter magazine to answer: "Why is the winner of a design competition advertising for help to design the helicopter in which he won the competition?"

A Piasecki spokesman told *AVIATION* Week that the answer to the question was that the technical personnel now being sought specifically for the HRP-2000 project but for other company work as well.

He also reported that the company had filed its HRP-1 helicopter back by the end of the year in other cases. This is a design and that others were being ordered to service by a new helicopter program. He denied newspaper reports that the grounding had been caused by transmission shaft problems and being feasible.

Question of whether the HRP-2 design which was the USAF competition was a design still to be completed is significant under conditions of the competition. Commission called for a prototype design. But if other design modifications are required from the basic HRP-2 type used as the flying prototype (in order to meet the larger weight, 1,800-2,000 lbs. engine of 1000 hp. specified, instead of the 600 hp. engine used in the HRP-2), there can be protest raised by other competitors in the competition.

### Tired of Waiting

About mid-century costs and company's unreasonable, paid-out delay suffered by companies using made outposts from CAR have taken their toll in the kind of a transmittal, such type service case. Eight of the twelve applicants in the case dropped out last month. The remaining four—Air America, Texas Airways, Airway, and Lakes Airline—have been listed. The case is now being handled by the Federal Aviation Commission. The case is now being handled by the Federal Aviation Commission. The case is now being handled by the Federal Aviation Commission.

Gen. Lawrence Kuter, lately at least the place would be operated by the airline under contract. At an executive session, Kuter reported to the Senate Committee on Foreign Commerce. Committee that present audit reports is only about one-third of estimated M-Day requirements, but he offered no concrete progress to restore the potential.

### Subsidy Separation

With expectation general that Congress will direct a separation of aid and aid, the Senate Committee on Foreign Commerce is now looking on the matter of who will establish the compensation rates. There are three proposals.

- Civil Aeronautics Board, which asks \$100,000 for necessary studies. Members of House Appropriations Committee, however, feel that the Board has sufficient data on airline operations to fix compensatory rates without additional research.
- Ernst & Ernst, the New York accounting firm which made a \$100,000 "paid" study for the Senate Interstate and Foreign Commerce Committee.
- Citizens Committee for the Helicopter Report which includes Eastern Air Lines president Capt. E. V. Rickenbacker in its membership, has volunteered to establish rates without a fee for the House Interstate and Foreign Commerce Committee.

### M-Day Plan

Joint chiefs of Staff's "M-Day" plan call for the requisitioning of all four engine commercial aircraft by MATS, according to MATS commander Gen.

more money, have accounts, and perform the job as a "public service". Some compensation, however, CAR as we transport, possibly, but that the Board might be too late in setting compensatory rates.

### To Farm or Not To Farm

Line of subcontracting or "farming out" maintenance work, which figures in recent weeks in the fight against both Northwest Airlines and American Airlines, has a checkered background in labor relations history. Many airlines agree that a company cannot be the right to farm out work of the labor agreement doesn't specifically ban this practice. But other airlines have held that a company violates the "no-farm" of its labor contract if it allows outside firms to subcontract for the purpose of depriving its employees of work which is covered by the labor agreement.

### Juggling Group Strengths

Published reports concerning from Defense Department that B-59 and B-50 groups would be increased to 55 planes per group, thus doubling group strength, is misleading.

An F-100 has three B-36 groups, three B-50 groups, and one B-59 group. Three B-59 and three B-29 groups are to be added to a 65-plane strength comprised partly of aerial tankers and partly of bombers.

Shift in strength is aimed at giving B-29 and B-59 groups range equivalent to B-36 groups-out of increasing group combat strength.

### Hits Feeders

Anthony Program, monthly organ of Robert B. Young's Fellowship for Railway Progress, is now the leader as far as an interest case. The publication said that "CAR again ready to go on indefinitely, increasing local airlines which have little chance of ever achieving real self-sufficiency, and what will always cost the taxpayer (in more) than the public would be benefited." Certified airlines, including feeders, are guaranteed a 7 percent profit after taxes. Anthony Program declared, adding, however, that "this new of airlines looks particularly good alongside the 7.6 percent profit averaged by the railroads since 1921."







planning with Secretary Johnston and his policies, previously indicated on several occasions by Rep. Carl Vinson (D., Ga.), chairman of the powerful committee. That the report...

The Air Force holds the primary responsibility for conducting strategic bombing. It has maintained that the B-55 bomber is its foremost weapon to carry out that mission. The committee holds that the nation must rely upon the judgment of its professional leaders in their respective fields. And that the nation's leaders in respect to weapons of the Air Force are the leaders of the U. S. Air Force.

**• Career Considerations**—Stating that it "displaces the manner of cancellation of the Navy's expenditures, the own nation and it would 'unhindered' school for the present—it regards the retention of the 'own' because of the pressure of other shipbuilding programs and budgetary limitations, but added:

The committee considers it sound policy, however, for the nation to follow the advice of its professional leaders as regards to that subject in the near future as has been heretofore done in respect to the B-55 bomber. In the committee's view, the nation's leaders in respect to naval weapons are the leaders of the U. S. Navy.

**• Road Rule**—The committee emphasized that the role of the Joint Weapons Systems Evaluation Board is to evaluate weapons "after" they have been developed, "not to restrict the process while type of new weapons that will or will not develop." The B-55, however, it was stipulated, is new within the proper generation of the F-4, and added that "future new generations of weapons should not be under taken until the recommendations of this board are available to the Joint Chiefs of Staff."

Highlights of the report:

- **Representation of the members of Adm. Louis Donald, former Chief of Naval Operations, in "a report against the long range future" in the congressional committee (ARMY/Navy News, Jan. 31).**

The center was pictured as "a blow against effective representative government in that it tends to subordinate witnesses and hence discounts the testimony of the line and honest testimony to the Congress."

**• Dismissal** that the committee would consider legislation regarding that the Secretary of Defense "control" with the House and Senate Appropriations Committee before submitting any proposed funds for the department. At Secretary Louis Johnston did not funds for a 70-ship USAF fleet year.

**• A dissent** but at Johnston's recovery progress because of the strike due to the development of modern weapons, "the nation can no longer afford to maintain

planning in compliance as to its defense for an indefinite time, thus nation must maintain modern, state-of-the-art defense forces capable of anticipating and dealing with a sudden attack (U.S.), the report said.

**• Antitake Defense**—The committee interpreted that USAF Navy differences will continue because they are rooted in fundamental professional disagreements on the art of war, with service personnel, policies, and the threat for now or barely entering into the picture that these steps were recommended to quell antitake.

**• USAF** should promote a closer relationship with Marine Corps aviation and the ground forces to develop sound close air support tactics and techniques. A joint training center to accomplish this should be promptly established.

**• Joint training activities** should be established between USAF and Navy tactical aviation.

**• But** should be lifted during Naval aviation personnel from the activities of USAF's Strategic Air Command.

**• Information** was given to the committee in the House version the B-55 should be augmented.

Two policy recommendations by the

committee were made: Navy veterans. The committee endorsed testimony for the individual services in technical matters during the formative stages of acquisition.

It requested membership on the Joint Chiefs of Staff for the Commandant of the Marine Corps, and that the commandant retire every five years. The chairman, said, was not in JCS discussion. Under the recommendation, the Marine Corps-Navy team would have two votes to the two votes of the Army and USAF, which frequently vote together on strategic questions.

## McGraw-Hill Change

The McGraw-Hill Publishing Co., publisher of *American Warplane*, has announced the resignation of James H. McGraw, Jr., as President and Chairman of the Board.

Gen. W. McGraw, who had been Vice President and Treasurer, was named to succeed him. Joseph A. Gerety was elected Treasurer in addition to his former duties as Secretary.

The office of Executive Vice President was created and Wilfred Chevrolet appointed to that post.



FIRST AEROBIC FLIGHT PHOTOS

After driving his mobile Avanca down Langley, Wash. to Chicks, Wash., at 40 mph, the flight component landed on behind. Adm. Wright, former chief of the Navy, was seen in the background. The engine was then taken to the Chicks hangar for the first time to a 410 ft. altitude above the field. Avanca has shown two solid engine tests on a conventional four control model test rig. The engine was then taken to the test rig, cut to start, and held motion, a solid test for right motion, and a right solid test.

factor. The three previous 100-lb. prototype has been added to R. F. Goodrich Co. for \$10,000, Taylor reports. He says the production version is off the \$4-5000. When used as an engine, Avanca wings fold back against the tailplane, which detaches from the automobile component, and leaves a tail. The tail propeller, driven by an extension shaft running through the tailplane, wears the glass smoothly quiet during flight. The engine reports.



P&W J-45 test unit shown in flight; engine mounted on test rig.



AFTERBURNER, having hydrothermally opened "exhaust" for repeating exhaust test.

## P&W Unveils 6250-lb.-Thrust J-48

New engine, giving 8000 lb. thrust with afterburning, slated to power one Navy and two AF planes.

By Alexander McCreath

Last Thursday-Pratt & Whitney's powerful new, turbojet J-48, rated out a challenge to other American jet engines last week from its own cell. As it is, the engine has not yet been tested in flight, but it is the most powerful jet engine now flying with U. S. and is intended "in the world."

William P. Green, general manager of the Pratt & Whitney Aircraft division, United Aircraft Corp., announced an initial \$10-million Navy order for 264 of the J-48 to power Grumman F-119 fighter planes. Since the first J-48 engine, P&W has received a \$9.5 million order for 148 and 142 engines. The 6250-lb.-thrust engine (fly in the air at sea level) has already flown in the

F-119. Further, and in the North American F-119A, rated wing position jet engine, developed by the USAF.

**• Afterburner**—For brief bursts the large afterburner pipe with thrust effect added to the base engine gives it a phenomenal increase of power beyond the jet engine to around 8000 lb. thrust. The thrust power is achieved in fact consumption approximately twice that of operation without the burner on the rate of pounds of fuel to pounds of thrust.

Besides completing more than 20 successful flights in the USAF and Navy jet fighter prototypes, the J-48 has completed 1000 hr. of ground test run including 200 hr. of endurance tests in military rating, and has delivered "non-sustainable" thrust, then, it generated

thrust, with and without afterburner, the manufacturer stated.

**• Pratt & Whitney**—The engine team in industry in British as well as American engineering staff, in a combined development of the Pratt & Whitney J-48 Turbo-Wing, developed from the Pratt & Whitney J-48. The J-48 is Pratt & Whitney's counterpart of the J-48.

Green said that he expected the engineering cooperation would continue on subsequent engine variants between the two firms. Pratt & Whitney has not yet filed an application for the J-48, which has the same 6250 lb. dry rating but Pratt & Whitney will make the engineering data available if the British want it. The J-48 is scheduled for installation in an experimental British jet fighter but is not yet flown as a primary installation.

**• Pratt & Whitney**—The new engine is a half inch larger in diameter (50 in.) than its predecessor the J-47 which has a base dry rating of 5000 lb. and a 5700 lb. thrust rating with water injection. Pratt & Whitney reported that the J-48 was tested in a Pacific against another Grumman engine power by "another American-built engine also of basic British design" (Army J-48) and that the J-48 powered Pratt & Whitney's aircraft in comparison to both 30,000 and 40,000 lb. The tests were conducted by Grumman and the Navy.

**• 2000-lb.-length** of the J-48 without afterburner is 5 ft. 10 in. But the addition of the big "exhaust" nozzle doubles the length of the powerplant. Wright is reported as less than 2000 lb. previously also without afterburner.

Like its predecessor, the J-48, the new engine is a centrifugal type with single stage compressor, 1 lbm double-boost impulse and has double air inlet, a high-stage turbine and one combustion chamber.

**• Model Changes**—Improvements over the earlier model are in redesign of the nozzle to improve the air intake, larger turbine blades to enable the engine to run at 30,000 rpm, and larger fuel injection processes at the combustion chamber than are found in any other American jet engine.

**• Pratt & Whitney**—New interest of the J-48 is in the afterburner. Additional fuel injection in the exhaust gas inlet produces more thrust to produce additional thrust. Significantly as the afterburner is heated, a partial expansion of the exhaust gas is achieved. Additional fuel injection in the exhaust gas inlet produces more thrust to produce additional thrust. Significantly as the afterburner is heated, a partial expansion of the exhaust gas is achieved. Additional fuel injection in the exhaust gas inlet produces more thrust to produce additional thrust. Significantly as the afterburner is heated, a partial expansion of the exhaust gas is achieved.





INSULATION has been tested in PWRs.

An expansion additional test for the preheat arrangement, AMERICAN WARE learned, is to draw a jet fighter, while using several pumps. If the results are spread under normal power conditions, then increasing the exhaust also, the airplane will certainly lose probably from 20 to 30 percent of its thrust, a useful test in giving design approaches, and perhaps under certain combat conditions.

► **Shower Boats—**The North American G-10A is the only plane flying with the full-sized shower installation, in the Convair F4V-5, a smaller plane, with a shorter showerbar to hold both of crewmen approaching those of the J-42 installation in the Panther.

A final phase in which the J-42 is expected to fly, even in the Lockheed F-10H night fighter.

► **Roll Scale in Bombers—**At the present, propeller-driven engines are undergoing ground and flight testing, while engine production engines are being put to efforts, with full-scale production scheduled to begin next summer, when production testing of the 12,000 rpm turbo engines to make the J-42 is also planned.

Intensification of technical data between the British and American firms revealed frequent tests by personnel of both companies. Created with principal engineering work on the J-42 development are General and Wilford Co., as chair of turboprop engineering, Wright Paterson, engineering manager William Brown, project engineer, and Rudy Yano. Pratt & Whitney issues representative of Kelly Brown, E. W. Brown, Rolls-Royce managing director, and Rex N. Davis and Civil Liberties, Rolls-Royce development engineers, varied the plant in Hartford to assist in the project.

► **Charging British—**described the combination of British and American engineering skills in "closing the gap" between his company and the American competition—General Electric, AMERICAN

## Correction

In the listing of aircraft manufacturing names on page 47 of the Feb. 27 issue of *Air Force Week*, workers at Republic Aviation Corp. were listed as being members of a local body of the International Union of Machinists. There is no union at Republic, although IUM again is trying to organize the workers after having lost one election, in September, 1948.

Writers' Week regrets the error.

Further, under the title "United States"

and Washington—despite a "three-fingered hand staff" which is attributed to Pratt & Whitney's wartime assignment to construct active engine parts, while the others were in jet engine development.

Many changes between the J-42 and the T-42 in addition to the above, were of American aircraft, different control systems, revised capacity of pumps, use of gasoline instead of kerosene, due to American turbine technical requirements, and design to be "in" on the government's stockpile of critical materials.

Speed of the 4-0-4 probably will be no greater than the 2-0-2, but maximum speed on flat is expected to run from 9,500 to 10,000 mph. The 4-0-4 will be powered and have rated fuel capacity, permitting longer range operations than are needed on the 2-0-2.

## Martin 4-0-4 Deal Reported With TWA

Glenn L. Martin Co.'s battle with Consolidated Value for the bulk share of the partner twin-engine transport market rapidly moved a new phase last week.

TWA reportedly had signed terms of agreement with Martin for around 40-45 Model 4-0-4 transports—the latter, some powerful version of the 2-0-2. Eastern Air Lines now close to signing for a like number of planes.

The 4-0-4 development, first revealed in *American Week*, Dec. 10, seems to the cold war between General and Martin for commercial sales between General and the civil demands which seemed 315 planes to U.S. airlines compared to 25 for Martin. Consolidated Value also sold more of its transports abroad.

► **Between Next Year—**First delivery of the 4-0-4 will probably go to TWA during 1951. But Martin has agreed to assemble a three series completed 2-0-2 (which was on the Martin line when orders ran out) and lease them to TWA while the 4-0-4 is made for delivery.

TWA and Eastern airlines have combined closely with the Martin for 4-0-4 project. The two carriers have

been able to agree on practically every detail in the lease plan except on the value schedule (*American Week*, Feb. 13). There was even a meeting of minds on the delivery-in-kind as new transport delivery terms.

► **Greater Capacity—**The 4-0-4 is planned to seat 40-44 passengers instead of 36 for the 2-0-2. This would be accomplished by adding 99 inches to the fuselage length. The new ship will have Pratt & Whitney R-2800 C-15 engines rated at 2,900 hp with superchargers.

Speed of the 4-0-4 probably will be no greater than the 2-0-2, but maximum speed on flat is expected to run from 9,500 to 10,000 mph. The 4-0-4 will be powered and have rated fuel capacity, permitting longer range operations than are needed on the 2-0-2.

## CAA Certificates New Licensing Engine

CAA has redeveloped the new Licensing, 175 hp four cylinder Model Q-20-10 engine which is now being delivered to aircraft companies for the 2-0-2. Eastern Air Lines now close to signing for a like number of planes.

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# AIR FORCE CONTRACTS

## AF Awards of Over \$100,000

An Air Force contract totaling \$2,071,381 for QG-37A aerial target space parts and test data was awarded by Ballistic Corp., Van Nuys, Calif., a listing of USAF contract awards by listing last disclosed. Contract was dated Dec. 8, 1949.

Other contracts awarded in excess of \$100,000 include:

**Aircraft Assembly Corp., Middlebrook, Ohio,** test C-1 aircraft stands, Jan. 11, 1950, \$155,772.

**American Enabling Co., Memphis, Tennessee** design, Jan. 27, 1949, \$153,380.

**Bell and Howell Co., Chicago,** jet engine test, Jan. 3, 1950, \$157,375.

**Boeing Products Division, Seattle, Wash.** Corp., South Bend, Ind., wheels and tires, Jan. 21, 1950, \$172,900.

**Boring Airplane Co., Seattle,** inspection, maintenance, and modification of B-24D, Jan. 20, 1950, \$192,000.

**Chrysler Corp., Chicago,** test and test, Jan. 1, 1950, \$145,075.

**Eastman Kodak Co., Rochester,** design, Jan. 18, 1950, \$193,330.

**Edison-Ford Motor Co., Detroit** test, Jan. 24, 1950, \$194,419.

**General Electric Co., Syracuse,** design, Jan. 11, 1950, \$155,772.

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## Awards of Less Than \$100,000

Following contracts for less than \$100,000 awarded by the Air Force in December 1949 of Davidson contracts in excess of \$100,000 appeared in *American Week*, Feb. 13.

**Aircraft Assembly Corp., Lansing, Mich.,** test, Jan. 11, 1950, \$155,772.

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# BETTER S AT THI



**Scaphery Beam**

**JULIUS COLEMAN**, President and General Manager, *Research Aircraft, Inc.*, which now manufactures *United States Aircraft*. He is a member of *NAA, IGE, ASA, and ASEE*.

**SINCE KITTY HAWK**, *East Airlines* was the first choice of many leading flyers. Proved by more than 40 years... backed by continuing research, expert and most modern aviation theories... *East Airlines Products* dependable performance!

**BETTER SERVICE WELCOMES YOU  
AT THIS MODERN AIRPORT!**



These stainless-steel washers are available at medium, regular, and large sizes shown in photograph.

**BOSTON-REVERE AIRPORT, REVERE, MASS.**

THAT FEELING OF WELCOME is strong at Boston Revere Airport, where the service and facilities mean rest and comfort and convenience to flyers. It is the largest class in private aviation and provides the only seamless base in the greater Boston area. It is only four miles from downtown Boston and is located directly on main highway, C-1, connecting with U.S. Route 1. A good maintenance, complete maintenance and repair facilities, and convenient transportation are available at this airport - where good service teams up with high-quality Ross Aviation Parts and Laboratory.

SINCE KITTY HAWK, Eise Aviation Products have been the first choice of many leading airlines and private flyers. Proved by more than 40 years of actual flying...backed by continuing research in one of America's largest and most modern aviation petroleum laboratories...Eise Aviation Products are famous for dependable performance!



## 60,000 feet UP in 2 minutes!

Over 11 miles ... straight up ... in two minutes ... 48,000 feet in the first minute ... and operating perfectly every foot of the way ... that's the kind of performance Pesco engineers are building into Pesco fuel pumps.

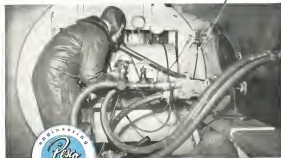
In Pesco's new fuel system test laboratory—a special building, specially equipped—Pesco engineers are constantly subjecting Pesco fuel pumps to operating conditions which reproduce perfectly the same conditions under which fuel pumps must perform in actual flight ... conditions of aircraft altitude, temperature and pressure changes ... changes even in the physical characteristics of the fuel.

Not once, but many times each pump must repeat the grueling tests ... pumping millions of gallons of fuel without benefit of lubrication. After each test, each pump is disassembled and every part checked. That's why Pesco engineers know Pesco pumps will deliver.

Testing is only one step in Pesco's program of research, engineering, manufacturing and testing that is constantly setting new and higher performance standards for fuel, air and vacuum pumps, hydraulic pumps and motors, and related accessories for the aircraft industry. It is an important reason why Pesco products will help your aircraft set new records for performance, safety and efficiency.

Looking inside the huge altitude chamber in Pesco's new fuel pump test laboratory building. Every altitude test operates in complete darkness under which 4,000 ft of safety air turbulence must operate out for standard form.

Pesco Model 030777 high-pressure fuel pump. This unit has a capacity of 450,000 psi and is capable of operating at 750 psi.



**BORG-WARNER CORPORATION**  
24700 NORTH MILLER ROAD BEDFORD, OHIO

## AERONAUTICAL ENGINEERING



## First Details of F3D Skyknight

Twin-jet, two-place, high-altitude, Navy night fighter designed to meet stiff requirements. Bailout is through tunnel to belly door.

By E. H. BRONKHORST\*

Most night fighters have been conventional day fighters. But the Douglas F3D Navy Skyknight, now in development, was designed strictly as a night fighter and is of the first vintage of jet propelled craft in this category.

Personal differences between day and night fighters is that the latter must depend on a large amount of radar equipment for vision in darkness and under adverse weather conditions. This usually results in increased weight and lowered performance in comparison with day fighters. But despite this radar-weight penalty, performance of our night fighters must be superior to that of bombers developed anywhere. Anything else would be unacceptable.

The F3D was developed with such performance in mind. Constructed in 1945, it was built to operate against high performance bombers expected to be in service in the early '50s.

► **Requirements Stringent**—The original specification requirement for this aircraft was somewhat in all a shock to the designers. High speed requirements appeared to be completely incompatible with those for a two-place cockpit arrangement and a large space forward of the cockpit for electronic night-fighting equipment. It was only after making many arrangements of equipment, crew, fuel, and powerplants that the final arrangement for the F3D was chosen.

The Navy's wisdom in establishing such exacting design requirements has been well proven during the past year of testing, since it has been amply demonstrated that the engine, engine, and radar combination can operate normally above the 40,000-ft level for which it was intended.

► **Basic Makeup**—In most respects the F3D's makeup is relatively conventional, employing a large percentage of 745 aluminum alloy and details of construction well proven in other Douglas aircraft.

A nose shield loading gear was chosen for increased stability and safety during high speed takeoffs and landings. An auxiliary tail wheel was added to prevent tail structure damage during landings. Landing gear is retractable and hydraulically operated.

Speed brakes similar to those developed on the AD Skyraider test craft are extended hydraulically from the aft part of the fuselage.

► **No Tip Tumble**—All normal fuel is located within the fuselage above the

engine, aft of the pilot's compartment. Auxiliary fuel is carried in drop tanks underwing and wing root filling pods.

Considerable thought was given the installation of wingtip tanks. They were not utilized, however, because of the serious problem of obtaining the necessary internal control with one tank empty, various air wing weight variations from loading loads with tanks full, additional complications of folding wings with tanks full, and the problem of filling tanks when wings are folded.

Provisions are made for the entry wing in cargo loads, rockets and other armament devices, in lieu of drop tanks, to increase the craft's maneuverability.

► **Engine**—Douglas-Two Westinghouse J44 jets were selected as the most suitable engines for this particular aircraft arrangement. The F3D's engines are so mounted in the fuselage that after the removal of cooling they can be located in landing tanks with a standard bomb bay.

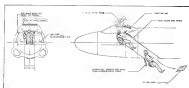
With this arrangement it is possible to obtain a complete engine change time of only 30 min.

Time was much more, originally, over the possible loss of cruise speed and fuel efficiency because of the great tank nature of the air vehicles and skewed area of the tailplanes. But after



a considerable amount of trend toward being it was found that it was possible to obtain normal duct and tailpipe efficiency with these arrangements.

► Cockpit-Glass, pressurization and cooling are provided in an Allison RB-17 engine turbine fuel by the engine compressor.



Sketch (above) shows FID cabin details and escape procedure for pilot through exit tunnel; bonanza photos (left) show stages of pilot bailout through craft's belly door.

Cockpit arrangement is Navy standard, except as necessarily modified by the solo fly-in seating.

All instruments and gauges are well lighted uniformly. All secondary control handles available to the components they operate.

Accommodations will probably shade off at the large flat windshield, but after being away underwing wingmen, it was concluded that the one shown offered the lowest possible drag to meet all requirements, including gun sighting and night vision.

► **Slide Out Bottom**—Anti-inertia slides quickly showed that it would be impossible to bail out of an airplane of this performance, in the usual manner, without injury.

Jettable seats were fast reconsidered and were considered the solution to the high-speed bailout problem. But these seats involved additional detachable weight, and had the disadvantage of separating the cockpit as close as to flying, hence much more subject to possibility of pressure time trouble.

Improved methods of egress were studied at great length, with the final conclusion that the safest means of escaping at high-speed would be to slide free first, downward and aft, through an escape chute so arranged that its bottom door acts as a wind screen to back the free air blast.

This system, recently, has been tested extremely well with many actual bailouts. And as a result it is considered not only very successful but a great improvement over jettable seats for aircraft in this speed range.

► **Advances**—From the outset it was considered inconceivably essential that all major advances be mounted within the airplane's normal structure. This required a considerable amount of instrument research and the development of non-aerobic structures such as the fuselage nose, fuselage tail, vertical tail tip, and dorsal fin, which house various lines of antennae.

While these laminated glass-cloth structures are considered satisfactory for the purpose intended, it is doubtful that the contractors will be used extensively for parts that can be made of aluminum alloy.

When the Skyright was conceived, calculations showed that the maximum cockpit radius requirements could hardly be met. Very strict weight control was put into effect and extra baggage was provided so that extra fuel could be carried in the event guaranteed weight could be bettered.

So successful were these efforts that comfort index and performance in general have been improved to the point where the FID Skyright is comparable in many respects to contemporary day fighters.

### Safer Blind Flying For Braniff Trainees

New blind flying equipment, developed by Bill Wallace, assistant pilot for Braniff International Airways, is being used by DC-6 pilot trainees at the carrier's Dallas base.

Wallace designed an eyeshield on a drive stem, equipped with the lenses removed. Short metal wires at the base fashioned blades for the glasses and a narrow shield to extend across the bottom of the student's windshield during heavy flights.

Formerly, a bronze rod vision shield of blue plastic, and orange colored plastic shields were fitted over the cockpit windows to be safe. The polished effect of the often heated rod vision to the instrument.

The equipment, according to Wallace, not only was cumbersome, but, because of the orange shields over the windows on the student's side, reduced visibility for the instructor riding in the cockpit's seat.

With students wearing the new blinders, the instructor has normal view from all windows.

Features like these make this **NEW**



New Beechcraft propeller



Increased take-off horsepower



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Three new map pockets



Four new arm rests



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New instrument panel design



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It has no equal in performance, speed, economy, strength, safety, style and comfort!

The new B35 Beechcraft Bonanza exceeds all previous for a sport with economy plane that's roomy, comfortable and easy to fly! New performance features at moderate horsepower add to its economy and safety. Bold styling and maintenance costs at a business economy level!

Need? New operating convenience and luxury appointments plus scores of refinements call for a personal inspection because there's more here to show only a few. See it! Get off the facts! You'll agree this greater than ever Beechcraft Bonanza is a better than ever value!

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Cruise speed, 170 mph  
Range, 710 miles  
Fuel economy, 9.2 gph



**Get all the facts!** There are hundreds more—about the extra advantages of the new Model B35 Beechcraft Bonanza. Check with your nearest Beechcraft distributor or dealer, or write for complete information on your company. Inquiries to Beech Aircraft Corporation, Wichita, Kansas.



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## *The kid that once was you . . .*

The boy in the window looks upward. His eyes are shining . . . his attention riveted on a plane in the sky.

As you watch him, you know he is not with you at all. He is piloting a plane through wind and clouds to the stars. He is no longer earth-bound—but a man with wings.

You know what he is thinking, for once you stood somewhere—in a window, at a school desk, on a hill—and had the same dream of glory. It was the same dream, and yet it wasn't.

When you were a youngster, chances are your first love affair was with a wire-strutted Jenny, or later, with a Winnie Mae, or a Spirit of St. Louis. Today's youngsters are enchanted with a Back Rogers world come true—sleek, streamlined rocket planes; planes without pilots; jet-propelled planes that fly faster than sound.

All of these are a part of modern aviation. It is a world fantastic beyond belief. And it becomes bigger and more incredible by the day.

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## Why Crash Protection Is Needed

Analysis of military and transport safety standards and accidents pinpoint seat and belt design.

Adequate crash protection takes on increasing importance with the possibility of crash fatality. When such fatality occurs, a delay of even a few seconds is disastrous, the aircraft may prove disastrous. Failure of seats and belts may result in injury to the occupants, which render them incapable of escape without assistance and, at the same time, the pick-up of bodies and other belongings will impede the efforts of rescue personnel. Even ejection parachutes may be completely trapped, or severely damaged in their efforts to save lives.

Aside from the physical aspects, the crash landing when seats and occupants are thrown around the cabin can add greatly to the danger of panic. Even the passenger who is not prone to panic may, under such conditions, have difficulty in securing himself, and so be helpless in locating and using available exits.

Consequently, as it applies to passenger aircraft, the crash landing has been dealt with extensively. Therefore, emphasis is placed here on transport planes and on military units to the extent permitted by security regulations. Further reason for this emphasis is that complete seats and form of the vehicles in air accidents make accurate analysis possible.

**Requirements.**—Crash load requirements of transport and military aircraft are summarized in the accompanying table.

The wide discrepancy in the values shown are immediately obvious. It is difficult to reconcile the 6 G requirement of the CAB for transport aircraft with the proposed American value of 25 G.

It is equally difficult to reconcile the 40 G of the U. S. Navy and the RAF with the 17 G of the USAF.

Another discrepancy difficult to understand is that between the CAB requirements for the transport and non-transport categories. While there may be a greater probability of an accident occurring to a personal plane than to a transport, does it follow that the crash will be of greater severity?

Certainly the differences in the requirements cannot be ignored, and indicate the need for a careful analysis of

the problem to determine sound criteria.

It should be noted, in this regard, that the Navy requirements were adopted in 1944, and the Australian transport requirement is currently proposed. That would indicate that the personnel responsible for these requirements had, on the basis of a comprehensive study of the problem, concluded that crash protection of the occupants, indicated is required. The Australian requirements recommending the 25 G requirement includes a complete study of the current literature on this subject.

**Strength of Belts.**—In order to evaluate the strength of seating safety belts under dynamic load, tests were conducted by the Naval Medical Research Institute on 61 new commercial belt wearing aircraft of CAR 15, for use by two persons. These belts had a rated strength of 2000 lb., as demonstrated in static tests.

In the drop tests, there were 4 cases in which strapping hardware failed, 2 in which hardware failed, 2 in which hardware failure occurred with resultant damage to the webbing, and 4 where no failure occurred.

Of the 61 belts tested, 49 belts failed in the webbing. Percentage distribution of failed belts for these 49 belts is shown in Fig. 1. It should be noted that only 1 belt, or 2 percent of the total, failed at less than 1000 lb., and only 7 belts, or 14 percent, at less than 2000 lb.

Study one percent of the belts carried loads between 2500 and 3000 lb. and 25 percent failed at loads between 1000 and 1500 lb. Most strength of all

belts tested was approximately 2000 lb. While these tests were limited to "two-person" belts, it should be noted that the results indicate an apparent ratio of the strength in dynamic test to that in static test. It therefore seems reasonable to assume that the same ratio of dynamic to static test strength should obtain for belts rated at 1000 lb.

This would give a probability value of strength of 1250 lb., and a static strength of 1490 lb., for "one person" belts.

**Record Analysis.**—An analysis has been made of CAB statistics on airline accidents for the 11-year period from Jan. 1, 1938, through Dec. 31, 1948.

While an Australian analysis indicates no significant change in accidents in which cockpit or cabin walls collapsed or disintegrated should be recognized as "survivable," for the purposes of this analysis the term "survivable" has been restricted to those accidents in which little or no injury was sustained by survivors. (Some of the accidents that resulted not to have been survivable may actually have been so under the broader scope of the term.)

During the period under consideration, there was a total of 49 fatal accidents, of which 21, or 42.9 percent, were survivable. Forty-five percent of the passengers and 62 percent of the crew were killed in the survivable accidents.

The distribution of the maximum percentage of fatalities in terms of the survivable accidents is shown in Fig. 2, and a review of the total number of fatalities is shown in Fig. 3.

Total number of passenger fatalities in all accidents was 571, of which 169 occurred in the survivable accidents. Hence, it is assumed that approximately 30 percent of the total number of fatalities could have occurred 100 percent passenger survival in the survivable accidents, there would have been a reduction of 25 percent in the total number of fatalities.

**Fatality Rates.**—Since the safety records of the airlines are computed in terms of passenger fatalities per 100,000 civilian passenger miles, the overall would have been improved that same percentage, and the safety rate for the period could have been 1.6 instead of the actual 2.2.

Fig. 4 shows the yearly-year reduction in the fatality rate which might have resulted from improved cockpit protection. The best airline safety records in the 11-year period were achieved in 1939 and 1946, when the rate was 1.2 fatalities per 100,000 passenger miles.

But, had all occupants survived in the survivable accidents, the rate would have reached a low of 0.27 in 1939 and 0.36 in 1946. Such rates are directly comparable with those of the railroads.

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- ✓ **ALL-METAL DURABILITY**. Whole and built-in metal.
- ✓ **EXHAUSTED-FLAME FUEL SYSTEM** with dual pumps.
- ✓ **EXCLUSIVE TWO-COIN** flaps for smooth, efficient, coordinated control.

### Crash Load Requirements

Agency	Load Factor	Remarks
U.S. Air Force	10 G	Dynamic
U.S. Navy	40 G	Dynamic
		Included 1941
RAF	25 G	40 G Ultimate
CAB	6 G	Ultimate
		Transport Category
CAB	9 G	Ultimate
		Non-Transport Category
Australian Dept.	25 G	Proposed
Civil Aviation		Proposed

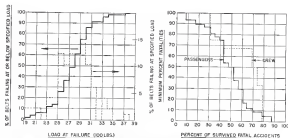


Fig. 1. Distribution of failing loads of duty nine 2000-lb. belts as which the writing failed.

Less with greater commitment, all occupants might not have survived in all of these crashes. On the other hand, it is possible that some occupants might have survived in crashes in which there were no serious injuries. Hence, the air passenger model above may be considered as an approximately indication of the need which might have been required.

While the above discussion has been limited to fatalities, it must be noted that during the same period, 100 passengers received serious injuries, in both fatal and nonfatal accidents. Most of these injuries resulted from seat and belt failures. Unfortunately, complete statistics on the frequency of such failures, particularly in nonfatal accidents, are not available.

**► Examples Cited—**While data are not directly available as to the cause of injury in all of the accidents considered, a few specific examples may serve to illustrate the fact that many of these accidents could have been prevented by stronger safety belts and seats.

On seat to point is a crash of a 4-engine transport during takeoff, in which 41 of the 44 passengers, and 2 of 4 crew members, were killed.

The particular crash was not of extreme violence, as indicated by the fact that immediately following the impact, the cabin was not damaged. The cabin was comparatively intact with all seats, with the exception of the hostesses' seats, were found detached from the floor.

Testimony of crew personnel at the CAB hearing indicates that many people were seriously injured by over turned chairs, and that many crew

were seriously injured by the resulting wreckage in the cabin.

**► Load Factors—**For destroyed most of the safety belts, so that it was impossible to determine the extent of belt failure. However, one of the hostesses' belts was occupationally extended, and found to be broken, thus permitting an evaluation of the work load involved in this accident.

If it is assumed that the passenger weighed approximately 125 lb., the maximum load factor would have been approximately 10 G, over the probability value of belt strength at 1750 lb. indicated previously for "one-person" belts.

But, if the belt developed the mean strength of 1400 lb., the resulting load factor would have been over 11 G. (It should be noted that many transport aircraft provide each occupant with a belt approved for two persons—a 2800 lb. belt.) If this were true of the aircraft involved in this accident, load factors of double the above value would be indicated.)

These are maximum values of the load factor, since there is no proof that the belt did not fail before the peak deceleration was reached.

The above load factor are based on the assumption that the restraint forces acted in the plane of the belt. If the actual deceleration was in the horizontal plane, the load factor in this direction would be less than that cited, by the cosine of the belt angle.

The load factor at the deceleration curve would be lower than that found in the cabin, because of energy absorption from structural deformation. This could tend to affect the effect of

neglecting the belt angle.

While not directly connected with seat and belt tests, one other aspect of such accidents is the accident itself. The pilot testified that the cockpit was unmovable, and was wedged in his seat as a result of failure of baggage compartment structure immediately behind him. The pilot was unable to leave the cockpit, and in the time available before he became too restless, could not get his seat out of his seat.

The pilot also testified that he attempted to go back into the cabin to assist occupants, but was prevented from doing so by baggage blocking the passageway, because of failure of seat structure.

**► Seat Action—**A second accident involved a crash landing of a two-engine aircraft immediately after takeoff. In this instance, there were no fatalities, but the condition of seats and belts permits an estimation of the magnitude of the deceleration involved.

The airplane made a belly landing in an open field, and slid approximately 85 yards before striking a 4-ft. metal obstruction along a road. The aircraft nose over the obstruction, and came to rest on the opposite side, with the empennage still overhanging the road. The nose of the aircraft had struck the obstruction at an angle, opening a wide gap in the right side of the fuselage, just aft of the cockpit. Crews for broke out, but was extinguished promptly.

Only three seats had completely free from the supporting structure. There were on the right side, immediately adjacent to the baggage failure. Three

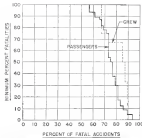


Fig. 3. Distribution of minimum percentage of fatalities in five visible airline accidents, 1935-1948.

were large deformation of many seats, however, and so that if the seat had been pulled up between 2 and 4 ft., although the fittings did not come completely free from the floor, it is almost highly probable that a small increase in either the magnitude or duration of the peak load would have produced complete failure. Therefore, the accident tends to indicate the limited severity of crash which this aircraft can withstand without seat failure.

Testimony at the CAB hearing indicated that the seats and supporting structure had been tested for the loads specified in CAR 45, and had shown little or no deformation at these loads. Therefore, although the load on the seats in this accident, they are actually that the first load for that particular type of airplane. The aircraft was equipped with belts approved for use by two persons, that is, 2000 lb. rated strength, for each occupant.

Only one belt failed. This occurred as a seat which was near the middle of the cabin, and on which the rear leg had pulled up, as described above. It is believed that the passenger weighed less than the rated strength of 245 lb. On the basis of the minimum probable belt strength of 1750 lb., found in the tests, a load factor of slightly over 10 G is indicated. A more conservative assumption of belt strength of 2300 lb., which would encompass 97 percent of the belts tested, would indicate a load factor of nearly 9.5 G.

If the belt strength were equal to the rated test value of 2000 lb., the load factor must have been over 11 G. The 345 lb. weight is that of the

average passenger on board the airplane, so that if the seat had been occupied by anyone else, higher load factors would be indicated.)

Yet this was a comparatively modern craft, when judged either by the extent of the damage to the fuselage, or by the circumstances of the accident itself.

**► Leg Load—**As in the case of the first accident discussed, these values are representative of the maximum load factor in the accident. A maximum value of the peak deceleration cannot be determined, because of the absence of data on the ultimate strength of the seat structure.

The fact that the rear leg failed on the seat on which the belt failure occurred, however, would tend to indicate that the pulling at the seat and restraining would occur at approximately the same load as the belt failure. These facts, the corresponding yielding of rear legs on other seats would indicate that these had been subjected to loads up approximately equal to the strength of the cabin, and on which the rear leg had pulled up, as described above. It is believed that the passenger weighed less than the rated strength of 245 lb. On the basis of the minimum probable belt strength of 1750 lb., found in the tests, a load factor of slightly over 10 G is indicated. A more conservative assumption of belt strength of 2300 lb., which would encompass 97 percent of the belts tested, would indicate a load factor of nearly 9.5 G.

On the basis of the foregoing, it may be seen that the airplane probably experienced 15 to 16 G protection for an assumed passenger weight of 175 lb.

Since the load factor estimated above indicates that the two accidents just considered were of approximately the same severity, they provide an indication of the effect of increased crashworthiness

The airplane involved in the first accident had been certified under CAR 45, which required the equivalent of a forward acting load factor of approximately 4 G, as may not be capable of meeting the 6 G specified in CAR 45.

However, even had the airplane conformed to the newer regulations, the results of the accident would probably not have been greatly affected, as the indicated load factor exceeds that specified in CAR 45.

The airplane in the second accident, on the other hand, has been shown to provide crash protection of approximately 21 times that required. In the first accident, all seats were lost, and 41 of the 44 passengers, and 2 of the 4 crew members, were killed. In the second, most of the seats and belts held, and all of the 41 passengers and 3 crew members survived, even though many passengers were injured in varying degrees.

**► Adequate Crashworthiness—**The foregoing has established the inadequacy of the current level of crashworthiness, but has not established how good that modernity is. The accident which has been discussed was as previously pointed out, comparatively modern.

The level of protection in most commercial airplanes in the past has been too low to provide crash direct data on the necessary degree of protection. When belts fail or seats tear loose it is usually impossible to determine how much the peak loads exceeded the breaking strength of the failed seats.

Fortunately, however, some data are available which are of value in this regard. A Crash Inquiry Research report, issued five years ago, stated that out of

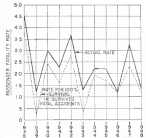


Fig. 4. Effect of 100 percent passenger survival on survivable accidents on other airline records, 1935-1948.



a total of 668 accidents involving a pay to 2700 passengers each week 1000 seats of 1955. safety belts broken by crash survivors. The previously cited tests have shown that such belts may be expected to develop not less than a 2500-lb strength under dynamic loading.

Therefore, if it is assumed that the average weight of the occupants in the cases reported in Crash Injury Research was 175 lb, corresponding to that assumed for ratings in the CAR, the average load factor in these accidents was of the order of 15 G.

However, on a basis of these same records, a well-known researcher states: "There have been cases in which passengers weighing as little as 120 lb broke standard 2-in. 7000-lb. safety belts... and survived. In such cases the load factor would have been slightly over 10 G."

Crash Injury Research "Inanimate Accidents" give details of many accidents in which the load factors were of this magnitude or higher and include ones in which the pilot sustained injuries the value was approximately 34 G, as determined by the speed and stopping distance of the aircraft.

• **Military Craft**—Aircraft records for military accidents also provide information as to the magnitude of crash decelerations. One example which may be used for is the history of the F-40 Thunderbolt. On the early production models of this airplane, there were frequent accidents in which the cockpit structure remained intact, but in which belt failure occurred in the seat line loss, resulting in total injury to the pilot, even though the crash protection met the Air Force requirements then in effect.

In one of the accident records, it was deemed to provide additional strength on the F-40D, and to this end a research program was carried out jointly by Republic Aviation Corp and Air Materiel Command. Outcome of this program was the incorporation of protection against a crash load of approximately 8000 lb. or 48 G for a 250-lb man. In the later models of the Thunderbolt, which provided the crash protection, seat failure was extremely rare although there were instances in which this occurred.

Apparently the accident experience of the RAF and the U.S. Navy indicated the existence of high decelerations in survivable accidents, and the need for a high level of crashworthiness, if one is to justify their adoption of the 40 G requirement.

• **Mission Values**—It has been seen that survivable crashes frequently involve load factors of 20 G and higher. It has also been indicated that protection of the order of 15 G was as much as adequate in a moderate crash of a transport airplane. Certainly, protection should be provided for accidents of greater severity.

It is felt that if loss of life in survivable accidents is to be effectively reduced, a crash load factor of 20 G minimum, the maximum survivable value for any airplane, and that values up to 40 G are desirable, and should be provided whenever practicable. The 20 G proposed is purely an engineering compromise, which should be adequate for a large percentage of accidents, at a minimum penalty in weight.

A corresponding degree of protection is also needed against upward and downward acting forces. Hence, in conjunction with the 20 G forward load factor of 10 G upward and 5 G side load should be required.

• **Head Injury**—The full benefit of seats and belts involving the requirement recommended above will not be realized unless protection is also provided against head impacts, which have been shown to be the most serious cause of fatality in aircraft accidents. Under even moderate G loads, the occupant problems over the head, unless restrained by shoulder harness. It is obviously impractical to require airline passengers to wear such harness. Reasonable protection can, however, be provided by properly designed seat backs. The use of light shock-absorbing structures, well upholstered, in place of a rigid tubular structure, can go a long way toward eliminating head injury.

For pilot and cockpit, shoulder harness is indicated, to prevent head to pay on instrument panels, windshields, etc. The use of such protection has been fully established in military aircraft. The use of an over-the-shoulder harness in conjunction with the harness seat with the pilot full freedom of motion, while still providing restraint against crash loads.

• **Restraint**—Tethering Seats—Another aspect of effective passenger protection is the use of restraint harness seats. While an evaluation of this method lies beyond the scope of this document, extensive research has demonstrated the value of this approach to the problem of crashworthiness.

The opinion is frequently expressed that passengers would double riding backward, yet in a report on the experience of a group of the RAF Transport

Command, which reported with this seating arrangement for one seat, it was observed that:

- Only one passenger in five objects to being backwards, and the majority strongly prefers it. The proportion of objects is almost exclusively made up of women passengers.
- Ninety-seven percent of the passengers consider that the view from the side door is better.
- One passenger in three considers that he definitely feels less secure when facing backward, and the remainder could feel no difference.
- Berths are less noticeable.
- Noise is less noticeable.

The entire problem of crashworthiness may be summed up by a statement contained in Aviation Medicine Memorandum No. 2, June 28, 1949, Australian Department of Civil Aviation:

"A consideration of the attributes of the aircraft design and abandonment of the public feature that aircraft seats do not have accidents are avoided. Accidents are still occurring and there is nothing to indicate that they will not continue to occur in the foreseeable future. It is reasonable that aircraft should meet crashworthiness as well as aerodynamic requirements."

United commercial airlines require increased levels of crashworthiness, the need must be taken by the airlines and their users.

If a purchaser evaluates civil designs by comparing cost, payload, and performance, without giving due credit to safety features, a complete advantage accrues to the manufacturer supplying such features, thereby discouraging their incorporation.

Details of NACA Hypersonic Tunnel

The National Advisory Committee for Aeronautics has revealed for the first time that it has been operating for over two years probably the largest and one of the fastest hypersonic wind tunnels in existence.

In operation since November, 1947, the tunnel is a blow down type located at Langley Laboratory, Hampton, Va. It is capable of speeds up to Mach 10 and can be used for testing models of aircraft. Its test section is 10 x 11 in. across. This over twice the size of the Mach 10 tunnel for ground aircraft research which opened only a few months ago at California Institute of Technology (Aviation Week, Dec. 22, '48).

The Cal Tech tunnel had a mere 5 x 5 in. test section. But it does have a major advantage over the NACA tunnel. It can operate continuously, while the Langley unit must shut down after only

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- Visual indicator
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- Control seat for 18 to 30 times longer seal life
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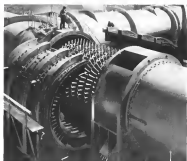
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WIND-MAKER AT AMES

This design of compressor section, with rotor casing, is built, assembled, tested at Ames Aeronautical Lab, Moffett Field, Calif., gives striking impression of size of unit required for this type test facility. Designed and produced at Ames, 416 precisely machined nose blades are set

in 5 stages of 72 blades each. Blade blades are set on cone structure in designated Two 25,000-hp. Whittaker turbines are tested in tandem to drive compressor at speeds between 775 and 800 rpm to push air through facility at 440 to 4700-psi static. Air flows at up to 1,700,000 cfm

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A superior safety nut. Starts from #8 to 1"



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...are made to meet NAS Specifications. Therefore are fully tested by pulling after heat treatment, an important UNBRAKO technique. Full range of standard sizes.

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## EXTERNAL WRENCHING NUTS

incorporate the famous FLEXLOC self-locking principle and one-piece, all-metal construction. The exceptional reliability of this construction has been proved by the actions of FLEXLOC used in the aircraft industry.

Other outstanding advantages include: Maximum strength with minimum weight. Approved under latest NAS Specifications. Large bearing surface. Positive self-locking—"won't shake loose".

Temperature range is: +350° F.

No special tools involved—just standard 12-point socket or hex wrenches. Designed for use in cramped quarters. Sizes from 1/8" to 3/4" HP Thread Series. Send for samples and information.



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**SPS**

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for those studies before it can be withdrawn for another person's build-up. First details of the NACA investigation, needed by John V. Becker, chief of the transportation research division at Langley Lab, at a recent meeting of the Aero-Mechanics section of the American Physical Society at the University of Virginia.

In a paper entitled "Results of Re-entree Hypersonic and Unsteady Flow Research at Langley," Aeronautical Laboratory Becker pointed out that "at an altitude approximately twice that of the speed of sound, the air temperature would fall to about -415° F, which is much colder than the temperature at which air liquefies (-315° F.)."

To offset this, the tunnel has a heat exchanger consisting of about 4,000 lb. of inertial heating fluids in designed to raise the inlet air temperature to over 500° F. In this work the heater, there still was evidence of actual liquefaction of a part of the air flow. Airflow had a fuzzy appearance and the speed in the tunnel dropped sharply.

The 11-in. tunnel currently is being operated at about Mach 7, equivalent to 3,750 mph at sea level. To produce this speed, air is sucked into a supply tank until the pressure reaches 750 psi, then forced through the test section into a vacuum tank of 12,000 in.-ft. capacity.

Becker and NACA are the lead for a hypersonic wind tunnel in the Mach 5-10 range in 1945, and revealed that Langley understood the development of a pilot model at that time. Present plans and other important design features then were laid out. "This means that," he explained, "it is advisable to build a blow-down type installation which was sufficiently flexible in design to permit any modifications."

## Douglas Rain Tunnel

A new, low-cost rain tunnel which simulates conditions ranging from a light mist to tropical downpours, with accompanying wind loads varying from zero to 100 mph, is being utilized for wind-tunnel studies at Douglas Aircraft Co., Inc.'s El Segundo plant.

With this facility the pilot or test equipment set in a simulated cockpit and experience conditions coming during a "wet" approach—checking the windshield for visibility, for example.

Cost of the installation is about \$40,000, that which, said, could normally be employed. A 150-hp. Climax engine (obtained from stock) is used to drive the turbine mounted, high-pressure propellers. These are two-blade, wooden units, purchased for less than \$50 each. By pre-setting and marking the propellers, and facility was completed in eight days.

## NEW AVIATION PRODUCTS



## Plane-Tower Talk Tape-Recorder

A new rubber-taped magnetic tape recorder, which allows for later advance of all communications between control tower and plane, has been installed at Los Angeles Municipal Airport. The system also is under study by the USAF and RCA.

A "live" demonstration of the equipment was given at the recent Army-Air Communications Conference at Cleveland, Ohio. Control tower operators from Cleveland Municipal Airport used instructions to six F-4 Phantom II pilots, duplicating flight conditions. After the recording period these were a playback.

The recorder installation should fill a basic need for the elimination of communication and confusion in investigation of accidents to planes during takeoff, approach and after operational phases. One example of distinctly advantage-giving application would have been in connection with the investigation of the recent P-51 Lightning Eastern Air Lines DC-4 collision over Washington National Airport.

Designed and built by the Bend Radio Laboratory Co., Cleveland, Ohio, the system embodies that company's long-time experience in signal detection work, and Accusonic Radio, Inc.'s know-how in serious communication devices. In effect, it comprises a cycle of communication use as in radio operation—that, one-way radio communication from tower to pilot, then, two-way radio contact and finally "reversal" of two-way communication, to permit later playback.

► **Tape Benefits**—Magnetic tape record-

ing is intended to offer three advantages: No process is required after recording, prior to reproduction.

► Many channels can be provided with a limited space.

► Recording can be made continuously without constant bulk of equipment.

► Recording sections can be treated of data prior to be of no permanent value. On a 0.5-in. wide, 4500 ft. long paper tape, as many as 34 independent messages can be recorded simultaneously for continuous period of 4 hours. Since the paper tape is only 0.002 in. thick, a total of 56 hours of recording can be stored in a space of approximately 71 cu. in.

► The tape is held in a 1-in. wide reel having a diameter of just under 14 in. It moves in a manner similar to that of a motion picture projector, from a supply reel to a takeup reel, passing over a series of recording heads with a speed of 74 in. per sec. There are as many recording heads as there are messages to be recorded.

► **Seventeen**—Since the recorder has to be ready to accept the full content of a pilot's message, it must be in operation all the time. To afford such service a minimum of two tape transport mechanisms is required. Whenever one mechanism has been in use for approximately four hours and comes close to exhausting its tape supply, the second tape transport mechanism must start operating. For a short period, the first message is recorded on the end of one tape and completed at the beginning of the other.

A failure associated with the supply reel checks continuously the amount

of tape available and automatically adjusts the operation of the next unit when it reaches the end of the tape supply.

► **Third**—The third tape transport mechanism is usually provided, which will automatically take over if any same before should come to either of the other units.

► **Amplifier Replacement**—The messages from the communication receiver are fed to as many independent recording amplifiers as channels are in operation, and are supplied from these recording amplifiers with an appropriate level to the individual recording heads.

All amplifiers are fed from a common power supply, with a standby power supply ready to take over automatically if the operating power supply should become faulty. Two amplifier channels are always combined in one single screwable channel, each channel having a tape which continuously rotates in proper operation. If failure occurs, the channel can be removed easily and replaced in a matter of seconds by a spare.

In the normal mode of operation, an attention serves the requirement for changing the heads once every eight hours. The change in head device requires no particular attention.

► **Playback**—For reproduction, a fourth tape transport mechanism is provided, associated with two playback amplifiers. Each of these can be connected to any one of the 16 channels. Thus, it is possible to listen simultaneously to two recordings which have been made at any instant and compare the respective tapes to the events.

Because the playback units will be consulted only rarely, the drive mechanism of the reproducer can be used to amplify any recording tape transport mechanism for maintaining program continuity.

Operation requires approximately 300 watts. It is considered satisfactory, generally, to keep recordings for about 15 days after which the recordings can be changed to the tape used again. A total of 56 tape reels is required for each installation. It is reported that the tape will give satisfactory service for at least 1 year, and that 30 cents per hour per channel is the cost of the tape and maintenance for the recording medium, approximately 8.5 cents per hour per channel amortizing the total initial cost of the equipment.

The complete airport recorder system is 11 ft. 11 in. standard radio suite. Part includes two tape transport mechanisms and master recorder control panel.

Second reel contains a third tape transport mechanism and the complete electronic setup for the entire recorder. Third reel contains the playback and speaker units.



## Measures Rotation

For measuring average rotational speed of shaft and indicating variations in speed versus time, Rehtehner, made by Kay Electric Co., Pine Bluff, N. J., is claimed to be accurate to 1 percent over wide speed range and 0.1 seconds at single speed.

Equipment includes pickup device for attachment to shaft, cabinet containing electronic amplifiers, indicator circuit and oscilloscope (modified De Mont 304 H). This last also can be used for general work on closed, equipment is supplied without test fixture.

High frequency oscillator disc and pickup are used on shaft to be measured. Also included is potentiometer shaft speed in conjunction with millivoltmeter voltmeter. Oscilloscope indicates variations in speed in vertical direction and time in horizontal direction.

By use of suitable synchronizing or ramp signal proportional to shaft speed, rectilinear horizontal axis may be made proportional to shaft rotation. Standard speed range is 900 to 7200 rpm, but may be extended from 75 to 18,000 rpm on special order of the customer.

## Fights Frost

Standard timing and anti-freezing component, offered by Aviation Chemical Division of Pine Chemical, Inc., 211 E. 136th St., New York City, can be installed or operated on aircraft surfaces and is represented to meet all requirements of USAF Specification No. 1406.

Intended for application on wings and tail surfaces in use as wing generators or on wind surfaces to melt accumulated frost product is homogeneous liquid which can be diluted to 70 percent solution with water.

Product may be applied to surfaces before application of wing covers to prevent frost freezing to aerfoil.

Another advantage, according to maker, is that it leaves a residual film which inhibits even an occasional during takeoff periods.

Stratmaster contains poly and mono hydroxy alcohols, detergents, and car-

bon inhibitors. It is said to be non-corrosive to steel, aluminum alloy, Al-clad, brass and copper; does not cause pitting and staining, and has no effect on liquid, fabric, leather, leathers, leathers, enamel or rubber direct shoes.

Mixing point is 55 F, while shock point when diluted is 50 percent solution with water is 74-75 F. Product is available in 5 and 15 gal drums.

(Stratmaster is one product of a line of aviation chemicals each having some name of Strat plus suffix denoting type or primary purpose. In Feb. 6 issue of Aviation Week, in this section, our name was inadvertently referred to as Stratex.)



## Millisecond Timer

Of interest to manufacturers or persons engaged in research work, where equipment is required to measure very short time intervals associated with physical or chemical changes, is Chronostat millisecond timer, offered by Electronic Instruments Ltd., Richmond, Surrey, England, and distributed in the U. S. by Herman H. Strauch Co., Inc., 27 Park Place, New York, N. Y.

Designed for measuring time intervals between 1 and 10,000 milliseconds with an accuracy of 1-2 percent, device is available in two models. One has maximum range of 1 sec. to 6 sec., while the other has maximum of 10 sec. to 6 min.

Requiring 100-250 v., ac, 40-100c, single phase power source, instrument can be used for timing short intervals between changes in voltage, current, resistance, light intensity, sound level, liquid level, conductivity, pressure, etc. after function. Meter may almost any abrupt change in physical or chemical conditions can be arranged to operate over. A straightforward use, for instance, is the timing of intervals between simple events, such as the time elapsed between electrical contacts being opened or closed.

This portable unit weighs 25 lb., is said to be ruggedly built and uncomplicated. According to maker, apparatus is an angle that it can be learned to use in a few minutes by an unskilled operator.



## For Fuel Jobs

New hose and with explosion-proof motor, claimed to eliminate many hazards associated with conveying flammable and volatile materials, is offered by Clifford B. Hanes & Son, Inc., Westfield, N. Y., for use in fueling jets and trucks and in many other locations where closed hose transfer installations have been banned previously.

Motor, classified as Underwriters Approved Class 1, Group D, heavy-duty unit, features positively lubricated ball bearings. Drive unit only two sparkproof and class. Sealed switchgear is only control. Manufacturer says sealed motor needs no attention.

Device is supplied complete with approved gasoline hose, switch, tubing, fittings, 1/2 in. o.d., two wire selected switch, connectors and terminals.



## Fork Truck Device

To aid even further in the versatility of fork lift trucks, Yale & Towne Mfg. Co., Rossmore Blvd., Philadelphia 15, Pa., has developed hydraulically operated, side-chassis attachment designed for use with both Walker and Lift King trucks.

Self-aligning makes it possible to sit centrally "top" loads in auto centers, close to walls, over pipes, or in other confined storage and transfer areas. Device often characterizes material positioning in such enclosed spaces as trailer trucks and freight cars.

# FINANCIAL

## Differing Aviation Market Views

Boeing annual report shows greater concentration on aviation, while Continental's reflects lightplane decline.

Interesting contrasting results are disclosed in two major manufacturing policy decisions, in one case to pursue greater expansion in aviation and in the other to de-emphasize. This is highlighted by the annual reports released by Boeing Aircraft Corp. and Continental Motors Corp. The 1949 annual report apparently issued by Boeing, showed a sharp upward trend emphasis on aviation products. For the fiscal year ended Sept. 30, 1949, sales of aircraft products totaled \$44,750,000 in 47 percent of total revenue as compared with \$68 million in 1948.

Ratio Up—During the previous period of 1948 to 1949, aviation products accounted for only 31 percent of the total Boeing sales. In the previous period this ratio amounted to 18 percent in 1947 and 43 percent for 1946.

In the present period, automotive products accounted for the bulk of overall Boeing billings. But they constituted only 34 percent of total sales for the 1949 fiscal period. However, the declining importance of automotive products to Boeing last year resulted not from any lack of demand in this market but is directly attributable to strike at the company's major domestic supplying plant. With this strike settled, it is likely that Boeing will restore actual billings on automotive products this year.

Value Up—The company significantly reported that the increased aircraft products billings was not generally attributable to greater unit sales, but to the consistently increasing unit values of new components, materials, and structural capable of performance, more and more desirable fractions in larger and faster airplanes of all types.

The Boeing annual report also reveals the company's participation in various security, maintenance, developments. The engineering problems on which the company's divisions are engaged in collaboration with the military aviation, maintenance and more of airplanes are termed "classified."

These problems deal with the operation of very large propeller-driven engines and jet engines of many types, involving ignition and turbo-shafting, fuel supply and control, starting, electrical generation and control and other functions, including many types of thrust,

brakes, and wheels, revolutionary new audio communication and navigation systems for aircraft, a wide range of other developments in military and civilian air, the rapidly developing fields of guided missiles, rockets, and pilotless aircraft.

Sales Up—Spurred by aircraft products billings, total sales of Boeing for the 1949 fiscal year reached a new high, amounting to \$182,649,462 and up from the \$152,491,665 reported for the 1948 fiscal year. While sales were up, net earnings declined slightly from \$11,281,743 to \$11,486,750.

Previously, earnings would have followed the trend of sales were it not for the strike of last year. Profit margins for the separate divisions of the company are not available in the annual report, so it is hard to assess, however, that the contribution to net earnings by the aircraft products was far greater than indicated by its ratio to total company sales.

Dividends paid by Boeing amounted to \$1.50 per share during 1949, the same as in 1948. This annual distribution came to \$5,591,632 on the 3,717,453 shares outstanding, and represented slightly less than one-half of the earnings in both years. Dividend payments for many large corporate enterprises have had a tendency to average between 60 and 75 percent of earnings in recent years.

Working Capital Up—Restoration of earnings has provided Boeing not only to build up its working capital, but also has greatly facilitated a major expansion program.

During 1948-1949, the Boeing net working capital was \$73,328,670 an all-time high and a gain over the \$69,697,091 reported as of Sept. 30, 1948.

During the four-year period ended Sept. 30, 1949, Boeing spent \$14,635,000 for additions to, and replacement of plant facilities. This program was accomplished without benefit of any additional financing. The funds were provided from specific depreciation savings amounting to \$18,530,000, \$9,367,000 was derived from accumulated earnings prior to 1946, and the balance of \$4,241,000 came from accumulated earnings during the four-year period. The company net earnings, except part of its plant expansion pro-

grams has now been completed. Total stockholder equity at Boeing as of Sept. 30, 1949 amounted to \$86,353,477, or \$42.49 per share, an all-time peak. Paying of dividend orders at \$1.50 per share, slightly in excess of the \$162 million backlog reported at Sept. 30, 1948.

Continental—A sharply contrasting experience, with a decrease in aviation products, is revealed in the 1949 annual report just released by Continental Motors Corp.

In the previous period, Continental's aircraft engine sales amounted to \$14,717,500, or 15 percent of the company's total billings. As such it approximated the leading category. For 1948, aircraft engine sales constituted but 7 percent or only \$12,742,285 of Continental's total billings.

In considering again its changing fortunes in the aircraft engine field, the Continental management merely declares that it has experienced wide variations in demand for such engines over the years. However, the trend of airplane engines in 1947-1948 and 1949 has been downward "in the personal plane industry has been under pressure from the forces of a major business adjustment."

Other Markets—All indications support the belief that Continental is concentrating on other industrial markets. During 1949, the agricultural industry accounted for 43 percent of the company's total sales. Aircraft once more active in the automotive field, Continental appears to have lost ground in the market as well. Nevertheless, sales in this industrial group accounted for 12 percent of the company's total during last year.

Continental's net sales for the fiscal year ended Oct. 31, 1949, amounted to \$181,997,794, down sharply from the \$183,181,732 recorded for the previous year. Net revenues showed an even greater relative drop by declining from \$1,178,125 to \$1,801,285 during this period. While below its 1946 record, total net working capital as of Oct. 31, 1949, stood at \$10,000,000 over the previous year, amounting to \$27,767,350.

Two Approaches—The previous period shows that Boeing determined to maintain its interest in aviation. It did so by constant engineering and development of new product diversification which gained broader markets in aviation.

Continental Motors, while not forsaking the aviation industry, pursued a more diversified development in other fields. It appears that its move into aviation was represented by its airplane engine line with no attempt made to diversify for that market. With sales to other industries gaining, the emphasis on aviation products was "become even less pronounced." —Self Attached

## SALES & SERVICE

### Piper Distributors Briefed for '50

Men and women over 45 are top-drivest prospects, W. T. Piper tells salesman. Sixty Pacers delivered.

Eighty-six top aircraft salesmen, representing every state in the union, met at the Piper Aircraft Co.'s Lock Haven plant recently to take initial deliveries of the company's 1950 models and participate in a briefing geared to top Piper sales representatives (35 per cent over last year).

W. T. Piper, president and general manager, told the men that the real market comprises the men and women over 45 years of age—first-time buyers of the people with the money and spare time to use the airplane for sport, and therefore the need for long-distance travel.

Large Tri-Arrow-Sixty new Piper Pacers were flown to the distributors at the end of the week, showing that Piper's production line is rolling early this year. Deliveries to customers will be made in seven weeks from time order is placed with the distributor.

Only about 10 Piper Stinsons will be available for delivery in 1950—a new model is slated for appearance next year.

► **1948 Club Cadillacs**—The last total Piper 1948 Club necessary because top salesman, was observed during the meeting.

Among those who were said were

John W. Baker, Jr., Martin Aircraft Sales, Long Beach, Calif.; Angelo DePinto, DePinto Aviation Co., Minneapolis, A. W. Whelan, Portland, Ore.; Howard V. Conger, De Mooney Flying Service, Buffalo, Mont.; Ray W. Neill, Jr., Wm. Lee Airport, Lubbock, Tex.; E. E. Lucas, Ray Max Aircraft, Inc., Wichita, A. B. McIlhenny, St. Louis Flying Service, St. Louis and Omaha, S. Louis Park, Sherrill Jones, Inc., New York City Airport.

Together these men sold 500 planes last year.

### Piper Cruisers Patrol Hanford Area

Two Piper Cruisers, an engine and effectively by the Alameda County Commission in conducting an aerial patrol of the Hanford plutonium waste near Richland, Wash.

The air over the plant is closed to all aircraft except the patrol planes, but planes occasionally do wonder over the restricted area. The area is bounded by miles from the Air Force base at near Moses Lake and when the radar picks up a strange plane approaching the area its position and speed are relayed to the patrol.

If the plane is unknown it is too fast for the Piper Cruisers, the Moses Lake base sends out a P-51 or a P-54. If the offending plane is small enough, it is ordered to land at the patrol's airport. If it is an airplane or other large plane, the patrol or Air Force plane gets its number and it is traced.

Offenders have included student flyers following the Columbia River as a landmark, then running into the restricted area, pilots trying to save a few minutes' time by cutting a corner, and a few like the occasional transport pilot who thought he would give his passengers a special treat.

The CAA handles civilian cases, setting out fines from \$10 to \$500, while the military court handles its offenders.

The Cessna's hedgehog over the perimeter fence of the 6000-ft. area, was to take a close look at cars near the fence. If car's license plates duly with pseudo-serial "patrol," the patrol planes leave it alone. Should the plates be obscured or not on the patrol list, the pilot leads his plane on the road and investigates.

The jet patrol is connected through radio communication with the field control tower and with the ground patrol, whose responsibility is the operation area itself. The tower has a direct line to the ground patrol.

### Three Versions Of Navion in '50

A lower priced utility version of the Ryan Navion, priced at \$5445.50 by San Diego, completes the three-model 1950 line of planes being offered by Ryan International Corp., Glendale, Calif. The new model has low horsepower engine furnishings and equipment that is de luxe model sold at \$10,985. Completing line is the 370 hp. Lycoming-powered Super Navion capable of 170 mph, and priced at \$12,065, which is due on the market this month.

Major differences between utility and de luxe versions De luxe model has new manually controlled fuel flow and cylinder head temperature gauges, flexible base replacing rigid plumbing to flap and nose gear actuation cylinders, new fuel-to-cylinder ratio systems, in addition to that previously carried from previous line, new cabin air intake arrangement, three new radio sets for de luxe model.

Utility version has fewer accessories, but uses same basic engine and case 205 hp. Continental engine used in Model 116 radio with increased VHF transmitter, more power hydraulic actuation for landing gear and flaps. Purchaser may choose any specific added accessory used in de luxe model as optional extra equipment.



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### NEW AERONCA CHAMPION

Latest model Champion for 1950, the 110L, features a new Fordized nose and tail and color scheme giving impression of longer fuselage. Continental C-90 gives the craft top speed of 110, cruising speed of 100, and 180 mph climb. A 17-amp electrical system with starter is fitted and wiring for landing and instrument lights. Thin-type landing door handles, and landing bracket.

ing windows are standard. Optional equipment includes tail wheel, 54-gal auxiliary fuel tank, Sonotone radio-aided undelayed in, wall carrying wheel, under, metal prop, sensitive altimeter, Radio FVTR-10 radio transmitter including shielding, head set, miles, and speaker, navigation and landing lights in addition to a standard instrument.



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## AIR TRANSPORT

### Nonskeds Rally in Last-Ditch Fight

IACCA leads struggle to get congressional support on easing federal regulations. Seek probe of major lines.

Nonscheduled airlines are trying again to only their forces against the strongest federal economic regulations which threaten to push all but a few heavily independent out of the air transportation picture.

With their numbers badly diminished by bankruptcies and Civil Aeronautics Board enforcement regulations, the independents have only meager resources to throw into the battle. But they have again started up vigorously and some are—*in a limited way*.

► **Former on Congress**—Leading the current fight for broader needed operating rights is the Independent Air Council Conference of America, with headquarters in the La Salle Building, Washington, D. C. IACCA's original membership was mostly among Pacific Northwest-Alaska carriers but now includes nonscheduled lines operating transport type equipment in all sections of the country.

Headed by Anna E. Hirsch, president of Air Transport Associates Inc., a Seattle based nonsked, IACCA has announced the Senate Commerce Committee to pass over President Truman's administration of Jack Lee to CAB.

► **Lee Opposed**—The nonsked group is entering its last on Lee personally because his recommendations make him out as the man at the time, although he insisted congressional action against Authority, IACCA charges that all CAB members have subordinated to policies which will bring the independents to the wall and give presently reidentified carriers a monopoly on air transportation.

In defining action on Lee for a third time the Senate committee adopted a resolution requesting CAB to give Hirsch a hearing at which to set the nonsked's grievances against present Board economic regulations.

Hirsch told the Senate committee that CAB has undermined the development of adequate, economical and efficient air transportation. He said the Board has discriminated against the weakly by giving the certificated lines more subsidies for operating over competitive routes and has "acted to destroy the large regular operation by unconscionable oppressive regulation and drastic enforcement action."

► **CAB Hit**—The IACCA president as-

serts that CAB's endorsement of congressional moves to regulate subsidy from competitors and pay is a blow. He and CAB tried first to delay subsidy operation legislation and then to attempt to emasculate the bill through amendments.

Hirsch estimated that there is close consultation between the actions of CAB's office of enforcement against nonsked on the Pacific Northwest-Alaska run "and the needs of the Air American Airlines."

Last month, Hirsch's company and another nonsked, Golden North Air, was formally offered to carry mail between Seattle, Anchorage and Fairbanks, Alaska, for \$1 a year of permitting to operate regularly. The nonskeds had three proposals would over the government millions of dollars in mail pay now allotted to Pan American, Pacific Northwest and Northwest Airlines.

► **Justice Probe**—Meanwhile, Hirsch called on Rep. Emanuel Celler (D., N. Y.), chairman of the House Judiciary Committee, to persuade the Department of Justice to undertake a grand jury investigation of the "monopolistic and anticompetitive activities of the major airlines and later tentative appropriate court suits if warranted."

IACCA wants the Justice Department to intervene in a \$1.5 million suit filed last year by 88 W., a Concord, Calif., nonscheduled operator, against 10 certificated airlines and the Air Transport Union. 88 W., a member of IACCA, charged the certificated carriers with conspiracy and combination to so strain interstate air commerce in violation of the Sherman Anti-Trust Act. Charges include—discriminate IACCA's members—attack on CAB to grant subsidies for little prospect that federal regulations, attributing the frequency of noncertificated operators will be ended. The independents took their case against CAB's allegedly harmful policies to Congress a year ago, and several times before, to no avail.

As a result, CAB last spring abolished the Northwest Airlines under which the nonskeds had been flying. The independents were required to apply for individual operating equipment, and 97 of them did so.

But CAB has taken no formal action on these applications in the eight

months since they were filed. The Board is expected to issue a policy statement on the matter shortly.

► **Enforcement Fanned**—Meanwhile, the federal agency has passed its enforcement action against alleged nonsked violation of its regulations. Nineteen long struggle currently are pending in CAB proceedings aimed at settling their operating franchises.

The list of alleged violators—virtually a who's who in the industry—includes Air America, Air Transport Associates, Airco-Pacific, Inc., Aircor, Aeronautics, Eastern Airlines, Golden Airways, Golden North Air, Great Lakes Airlines, International Airlines, National Airlines, Northwest Airlines, Pacific Northwest Airlines, New England Air Express, Peninsular Air Transport, Seaboard & Western Airlines, Silverair Airlines, Trans American Airlines, Trans Caribbean Air Cargo Lines, Trans Ocean Air Lines and Viking Air Lines. Several other nonskeds have been forced by CAB to show cause why they shouldn't be required to cease and desist from further direct activity.

► **Court Decision**—Recently CAB was given another setback in its five against alleged nonsked violation when the U. S. Court of Appeals for the Second Circuit confirmed a lower court order granting the Board's request for an injunction against Modern Air Transport. New York. CAB had alleged that Modern violated the Civil Aeronautics Act by operating with excessive irregularity between New York and Puerto Rico.

Modern appealed the lower court's decision, claiming that CAB's standards of regularity were vague. The nonsked also contended that CAB, before seeking a court injunction, should have held a proceeding of its own to determine if there had actually been a violation of the Civil Aeronautics Act.

The Court of Appeals ruled that CAB's regulations on what constitutes excessive frequency and irregularity of service are clear. It added that because there could be no doubt of Modern's violation of standards, CAB was particularly directed to the courts for writ action to prevent further violations.

### UAL Still Studying Air Coach Service

United Air Lines, only one of the "Big Four" still holding out against coach service, could begin such service within 90 days after decision to enter the field, according to Curtis Reilly, vice president-director.

But he also indicated no early decision is in sight. The economic picture so far as coach is concerned is still cloudy, he told the New York Society



to Security Analysis, and "we do not like to start manufacturing new airlines we have a pretty good idea as to where we are coming out."

■ **Equipment Phase**—United's equity capital plan flows to eventual acquisition of aircraft. United said that of the eleven DC-6s on order, six are DC-6Bs, the version which can be used at a high-diversity transport and 52 passengers. These are to be delivered in the spring of 1961. The other five DC-6Bs are scheduled for delivery this spring.

No program for ordering new transport equipment has been developed. In Barker said, as the present DC-6s of United are considered superior to any current replacement available for the company's operations.

■ **Costs**—Barker said United's in the air transport industry's ability to reduce unit costs of operations during 1949.

On the basis of reports for the first nine months of 1949, the United of fiscal year ended the year, the lowest cost operator at about 45¢ per passenger mile, United second, at 50¢ per passenger mile and TWA third, at 55¢ per passenger mile. Inferred was that American's 18 percent more volume than United's last year was a result for the firm's better showing.

Probably the most important thing United was able to do last year was to increase employee efficiency, according to Barker. The average number of man hours on the payroll in 1949 was 10,047 as compared with 18,822 in 1948, or a reduction of 7 percent. That resulted in a 3 percent reduction in payroll cost and an employee turnover averaging, only 7 percent per month, considered the best in the firm.

A recent factor in United's success, due was the complete elimination of its two maintenance bases at San Francisco. It is estimated to have saved \$750,000 last year. In addition to its own maintenance, United does similar work at this base for the Philippine Airways, British Commonwealth Pacific Airways and PAA.

■ **Financing Improved**—At the 1949 year-end, United's working capital position was reported as slightly higher than at the Dec. 31, 1948, with an after retiring long term debt of \$5,730,000 and paying for five Boeing Strata Cruisers as well as other capital additions. Commitments for future capital obligations, largely represented by the DC-6s, come to about \$1 million. Barker does not believe that the company will be required to undertake any special financing for this purpose as payments will be made from current funds over a period of time as deliveries are completed.

Prospects for 1950, looking on-line seen developments, are expected to be

low early slowly the pattern set in 1949, as Barker's opinion. Air ground port showed encouraging gains during 1949 and is expected to do even better this year.

## American Airlines Tops the Field

American Airlines last year relied on a net profit of \$6,011,257 after taxes and apparently finished the title of top money-maker among domestic carriers. The excellent 1949 earnings compared with a net loss of \$2,951,671 in 1948. AA paid \$1,800,000 in federal income taxes last year. It had a carry forward tax credit of \$9,900,000.

With passenger traffic up 15 percent and freight business up 42 percent over 1948, AA's total revenues of some \$1,518 million were the highest in company history. Passenger revenue accounted for most of the gain, soaring from \$78,361,000 in 1948 to \$94,308,

900 last year. Expenses and freight revenue rose from \$4,183,000 to \$4,825,000.

Mail revenue was up only modestly—from \$4,745,000 to \$5,553,000. This increase resulted mostly from the larger volume of mail traffic handled.

American's expenses last year were \$96,694,000 against \$92,175,000 in 1948. Even so, the carrier is expected to be the lowest-cost operator among domestic carriers in 1949.

The company reported its current financial position as strong. As of Jan. 11, 1950, American had purchased \$4,950,000 of its debentures. The proceeds for refunding bond requirements of 1951, 1952 and 1953.

A provision of the debenture agreement specifies that dividends on the common stock will not be paid unless current surplus exceeds \$10,040,000. Although current surplus exceeded \$1,745,000 during 1949, the total of \$10,311,000 at year-end does not permit a common stock dividend at this time.



## Mobile Instrument Tester

A mobile laboratory equipped to test all types of aircraft instruments in half the time previously spent by airlines in this task, has been placed in service at N.Y. International Airport, Idlewild, by Radio Aircraft Service, Inc.

The lab is housed in an 8 x 30 ft air-conditioned trailer staffed by two RAS technicians. The unit, working with airlines and other aviation organizations, focuses in on the spot test center for any aircraft using the airport.

Spain instruments of all types are tested.

Designed by John Marotto, supervisor of overhaul at Durham's Woodside, N.Y., headquarters, and built there by OAS employees, the trailer installation exactly duplicates the test equipment installed in the main laboratory, where still maintain its usual service. Rated at the mobile tester are the same as at Woodside.

## ICAO to Study Met Problems

International Civil Aviation Organization's meteorological division will at attempt to have existing gaps in world's network of upper air weather reporting stations filled in. The worldwide network in North America and Western Europe was fairly complete, but in some spots in the world there are only two or three stations serving as crude observatories. ICAO officials point out that with modern aircraft now flying on scheduled operations throughout the upper atmosphere, better knowledge of weather conditions are necessary.

Pinpointing of new stations is seen as the major headache-out of operating a worldwide network for use now is estimated at \$18,000.

■ **Other Studies Planned**—Among other studies on the meteorological division's agenda are:

■ **Study of upper atmosphere physics** to the other data on past characteristics. The knowledge will be necessary for the design of jet aircraft at very high speeds.

■ **Coordination of specifications** for meteorological service systems for international use in connection with the development of a world standard.

■ **Coordination of astronomical** and geophysical systems to get better value from limited number of channels being used, and system of consequences of replacing radio telegraph with voice telephony in ground to air message of weather data.

■ **Classification of current types of aircraft** along to aid in forecasting, long range conditions and their probable character and severity.

■ **Possibility of reporting cloud height and visibility** starting at airport approaches rather than at several miles away which is now the general practice.

## Italian Carriers

Italian air line operated over a total area of 18,316 miles in 1949, according to the Ministry of Civil Aviation. Italian carrier flew 47,294 hrs and carried 166,832 passengers during the year.

Figures indicate the Italian line carried about half the traffic loss in Italy



## Britain's Bid for Feeder Market

De Havilland is grooming Heron, 4-engine, short-haul ship to replace D.H. 86s and DC-3s; price \$93,000.

Great Britain's De Havilland Aircraft Co. is promoting a new and large light transport for the feeder market.

A four-engine, short-haul ship, dubbed the Heron, is nearing completion and should be flying this summer. Carrying a \$93,000 price tag, it carries 19 passengers. The plane is a development of the four-engine de Havilland Dove and includes many Dove components in the wings, cockpit, main fuselage and magazine seats, control surfaces and internal parts.

■ **May Replace DC-3s**—The new plane will fly from 14 to 17 passengers, compared with eight to 11 for the Dove. It is designed to replace Britain's present D.H. 86 four-engine transport. As yet, it may also be used as a DC-3 replacement on some routes. The Dove-30 of which are now operating in 18 countries—now a replacement for the present four-engine D.H. 86 transport and D.H. 82 Queen Kestrel.

De Havilland says the Heron has been designed to give instant performance comparable with the Queen Kestrel and greater simplicity than has been offered in the Dove. The Heron has a fixed undercarriage, six engines, enlarged and tapered engines, non-flaring propellers and no hydraulics. Five feet on longer stage lengths a number of the Heron will be available to overcome a defect.

■ **Short Range**—Because of the small fields used by many of the world's feeder airports, the Heron has been designed for short takeoff and landing runs. It was last flown by B.R. Cooper Queen Series 18 short-draw, wing-mounted variable engine.

De Havilland says the Heron will have good economy at all stage lengths up to about 400 miles. It says that in some of the Heron's larger size it will operate at slightly less cost per ton mile of payload than the Dove.

components. Many components, the Heron can be produced quickly from existing tooling, and early deliveries can be produced at a lower cost. De Havilland points out that these components have been tested in four years of experience with the Dove, adding that all Dove operators who buy the Heron can select their spare parts stocks because of the interchangeability.

■ **Concrete and Range**—Detailed information on weight of the Heron will be 12,500 lb. with 14 passengers at 551 lb. each and with baggage stored at 10 lb. per cubic foot of available space, making a capacity payload of 1420 lb. The ship has a maximum altitude stage length of 10,000 ft. and a maximum speed of about 460 miles with the 340 lb. or capacity payload. Corresponding payload stage length in 150 miles with required full allowance.

With a payload of 2746 lb., the still air range becomes about 790 miles and the payload stage length, with reserve fuel allowance, a 400 miles. Maximum still-air range with full baggage of 1460 gal. and 1150 lb. of payload is 1150 miles, while the payload stage length (with reserve fuel allowance) at this loading is about 550 miles.

Recommended cruising speed with the fixed undercarriage version is 160 mph. On 15 percent throttle power at 5000 ft., but less undercarriage cruising speed up to 177 mph can be used if desired. Recommended cruising speed of the retractable undercarriage version is 175 mph, and maximum stage length with full 150 gal. baggage is given as 975 miles.

De Havilland claims the Heron will have good economy at all stage lengths up to about 400 miles. It says that in some of the Heron's larger size it will operate at slightly less cost per ton mile of payload than the Dove.

## LAS-S&W Pact

**Exclusive maintenance agreement calls for fixed flight-hour prices.**

Capping the rising trend of fixed price maintenance and overhaul, Seaboard & Western Airlines and Lockheed Aircraft Service, Inc., have entered into the first exclusive agreement ever signed for this type of work. LAS will maintain and overhaul S&W's entire fleet of five DC-8s at a fixed price per flight hour.

Under provisions of the agreement, Seaboard guarantees an annual maintenance of 6750 flight hours, involving an estimated maximum expenditure of \$154,800.

Engine-Overhaul, under the pact, has the maximum right to reject, overhaul and repair all S&W aircraft except for engines and in-transit inspections performed outside the continental limits of the U.S.

In addition to routine work as laid out with CAA standards and Seaboard's CAA-approved maintenance manual, LAS will be responsible for non-routine stress involving flight-tests with mandatory CAA supervision directed and supervision of releases.

LAS will be responsible for overhaul of all components other than engines and will check and supply spare parts either by night courier or by air. In addition, LAS will perform scheduled work such as landing gear overhauls, cabin wing panels, engines, control surfaces, fuselage sections, flaps, propellers, engine nacelles, doors, cabin equipment and major parts of interior lavatories.

LAS will also administer and maintain all necessary records and maintenance records.

First responsibility for inspection, maintenance and overhaul requirements remains with the Seaboard staff under W. H. Remington, vice president-engineering and maintenance, who will control the operations from headquarters in the hands of Lockheed Aircraft Service International, the LAS subsidiary at N.Y. International Airport.

Not First, But New—While the new contract is not the first fixed price per flight-hour maintenance agreement ever signed, it is the most extensive for a two-engine fleet operation, according to spokesmen for both companies.

What is believed to be the first such contract was one of limited scope entered into between Seaboard and LAS only in 1965 when Seaboard was held quarterly at the LAS Base at Minto Airfield, Seydlitz, Long Island.

As far back as two years ago, LAS established fixed prices for the overhaul

of hydraulic components for its bases at Minto Airfield, Seydlitz, N.Y., and Bethesda, Calif.

Wide Coverage—Since that time, LAS has expanded its fixed price structure to include almost every type of maintenance and overhaul work on aircraft-type and airframe parts, ranging from component, necessary and instrument overhaul to refueling operations, tank testing and including major overhaul work.

With its Seaboard contract closed, Lockheed Aircraft Service last week was trying to sell fixed-price engine maintenance to several foreign airlines operating out of New York's Idlewild and Airport.

## IATA to Meet Here

The 1959 annual general meeting of the International Air Transport Association will be held at San Francisco's Sheraton Hotel from Oct. 16 to 20. It will be the first IATA general assembly to be held in the United States.

Walter Lee Ferron, Trans World Airlines' board chairman, who was elected president of IATA at the association's last annual general meeting in The Hague in September, 1949, will take the office on the opening day of the San Francisco session.

U.S. flag airline members of IATA

will all arrive at San Francisco by air, with 50 other representatives on land from about 45 countries. U.S. members of IATA are American Airlines, American Overseas, British, Canadian, Eastern, National, Northwest, Pan American, TWA and United.

## SHORTLINES

► **Are Transport Area—Estimates** that domestic scheduled airlines are losing about 50 percent less from the Post Office per aircraft letter than they did two years ago.

► **Australia—Completed** 98.4 percent of its scheduled sales in 1949, against 90.6 percent in 1948. A CAA agreement has prohibited that the carrier be permitted to serve Springfield, Mass., through Bradley Field, Windsor Locks, Conn., instead of through Barnes Municipal Airport, Westfield, Mass.

► **AA** flew 617,770 lbs. of Airtel sent tablets in December and claims it is the largest monthly shipment from one company in the history of airtel.

► **American Overseas—The** company's service in Hamburg, Germany. Company recently used a Stratocruiser and a Constellation to fly 104 Menzies Caribbees to Europe on a 21-day tour program.

► **Boeing—Plans** to upgrade service to American, Pan Am, this week.

► **British European Airways—Capt** Richard Roper, BKA pilot, has become the world's first commercial pilot to be qualified officially to fly helicopter transports. The qualification is in the form of a special endorsement on his regular commercial pilot's license.

► **BOAC—Plans** to upgrade Stratocruiser service on its Montreal-London route on April 2. Eventually, BOAC hopes to operate the link entirely with Stratocruisers, transferring its Constellation to the mid-Atlantic with Sheraton March, 1947. BOAC's personnel has been reduced from 34-40 to about 12,500, while passenger and cargo capacity increased. Financial results for the last half of 1949 were disappointing because of currency devaluation, delayed deliveries of new aircraft and losses due to withdrawal of TWA from Pacific liner service.

► **Control—Despite** repairs from Boeing and Cessna, CAB will permit the lightplane trader operator to cut from 1.5 percent to about 5.2 cents a mile on its Bush-Bonanza service for a six-month period (Aviation Week Feb. 6). Cessna Inc. 260R133 of and in December, compared with 20,812 lbs in November, but passengers carried fell slightly to 406. Cessna completed 32.7 percent of its scheduled



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49

## Today's Coach Sermos

Today's test for the latest sermos on an coach and its long-term importance to aviation is attracting millions of thousands of customers comes from a speech.

The speech was made by Thomas W. S. Davis, now assistant secretary of commerce. Before his position we all knew him as just Tom Davis, United Air Lines' executive assistant in Washington.

Tom spoke these words to the American Airs of School Administration at Atlantic City.

In spite of widespread public opinion in aviation, too few Americans utilize the great network of air transportation. I am told that more than 15 million of our citizens live on air carrier routes in 1949. But I have learned from industry sources that about 86 percent of these 15 million are passengers on airplanes which means that in 1949 only about 1 million of these passengers were using air transportation for the first time. This is a poor showing for a nation of about 150 million people.

I am convinced that the true acceptance of air travel by the majority of our people is not caused by fear of flying—but by the cost of flying. In the very early days of the schools and the schools could afford to take tuition. In the early days of air transportation a similar condition existed. But gradually since the end of the war, there has developed within the air transport industry a recognition of the need to lower rates in order to carry more people, and more of the goods of commerce.

Today, it is common of our airlines are operating "coach type" in service. It is an axiom that no personizing this service and the CAB which enhanced it, have described this level as a coach operation in an "experiment".

It is no belief that this device and long or short development is a safe device that will have to use the mass market of potential passengers that have been for long unsuccessfully advised to buy air transportation.

I believe first within the run the great new bulk of our air travel will be in "coach" travel, as defined in the type of service which we now have—like us the same way, and for the same reason, that the great bulk of rail travel is coach instead of Pullman.

These new arrangements are good for you, Tom. These words make mighty good sense to us.

## Cuboose Is Ahead of the Engine

In a moment of generosity we wrote last Feb. 20 that the AAR of American Railroads practices good public relations.

We take it all back. The AAR's latest advertisement naming its national railroads proves how wrong we were. Ads and press releases should be convincing and fact-based.

But the AAR's latest message to America does neither. And we are convinced we learn from its mistakes.

The ad is topped by an illustration of a motorist at the wheel looking ahead at a great trailer truck supposedly extending his progress down the highway. Then comes this message:

Does That Look Farther?

Next time this happens to you, look's something you might think about.

We have subways in every freight-car yard of freight in our country. So anybody, in any part of the country, in any season of the year.

These subways are built for heavy-duty hauling—more in time even after the first billion dollars they have spent its improvement since the end of the war.

And the more freight subways are called upon to carry, the more efficiently and economically they can do the job—after all the more time your public highway will be less expensive to maintain, safe and more convenient to use.

Now, friends, the next time you read an ad like the one above, here's something you might think about. At least, these thoughts will be in the subject.

Why a that loaded truck—and the thousands of others—going down the highway? Because some shyster by his own fear and for what he considered a good reason decided to send that shyster by truck instead of train.

It seems a reasonable assumption to say that most of the trucks we see are making a profit. They cannot keep running indefinitely if they don't pay off. If they continue to pay off, that means millions of trucks are performing a needed service for the public. Apparently thousands of shysters—many of them motor car owners and drivers themselves—consider the cheaper, quicker public service worth some personal driving delays on the highway, and even perhaps more, at their ten dollars.

If the railroad had never sunk into their disastrous "public be damned" attitude it seems doubtful if the "conspiring" highway system ever would have been dreamed worth all the billions of public dollars we spent on it. And even if you do not go along with us on that assumption, surely you will on this one.

The rail, even in this so-called enlightened age, when they should have learned to teach from their own, ought to be advertising to get new customers on a competitive, business basis.

Instead, we see them sitting back, passively contented by the passing parade, waiting for customers to stay in. As they usually proclaim: "America, here are your subways, we have them all set up and waiting for you. They were built just to carry things. They must be good, we spent billions on them. It is your duty to use them. And look, now. Here is something we might possibly be able to persuade. If lots of you will forget about those rusty, bothersome trucks and faster service on cheaper rates, and if you come over and hand us your business as a platter, we will then be more efficient and our service won't be as bad as it is now and you can pay on those extra dollars you are throwing away on highway improvements. Isn't that a tempting inducement for you lucky shippers?"

Come, come, AAR—that's putting the cuboose ahead of the engine. But you ever hear of the good old American business habit of first setting up a better service than your competitors, then going out and beating on doors trying to sell, sell, sell? We hope the airlines never run as an ad like yours.

—ROBERT H. WOOD

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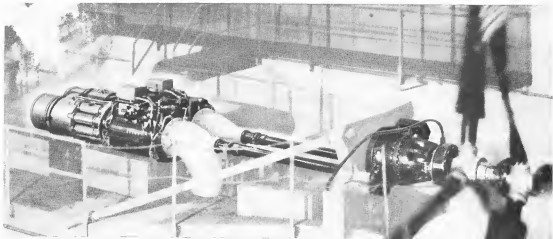
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